

IN THE SPECIFICATION

Please replace the paragraph beginning at page 1, line 5 with:

Measurement cell, similar to an injection mold to manufacture a plate that can be installed on an injection molding machine, which comprises a cavity supplied with a cooling and heating system that enables to generate a one-dimensional heat transfer regime on the central zone of the plate of the material to be analyzed, a set of pressure and temperature sensors installed fixed on the mold's body and connected to a data acquisition system to store the signals, characterized because it comprises additionally a removable and reusable device called the removable Unit of temperature sensor, which allows to introduce a group of at least three ~~thermoclements~~ temperature sensors in the cavity when the cell is open and keep them in exact positions with high precision during the cavity filling process with the melt material and during its next cooling, enabling the usage of the plate formed as such with the temperature sensors inside to measure the heating curves when the measurement Cell is operated at high temperature with its heating system.

Please replace the paragraph beginning at page 2, line 1 with:

Method to obtain, as of at least three temperature signals (triad) generated by the sensors of the removable unit of temperature sensor of the measurement Cell of this invention, curves of values of thermal diffusivity of a thermoplastic material as a function of the temperature and under the typical conditions of industrial ~~transformation~~ processing of these materials characterized as well because these values of thermal diffusivity meet the discretized differential equation of a one-dimensional non-stationary heat flow by conduction.

Please replace the paragraph beginning at page 2, line 15 with:

As it is widely known in the scientific and technical fields, the thermal diffusivity of materials like thermoplastic polymers shows significant temperature and speed dependence, with which this temperature varies during the cooling or heating processes inherent in the industrial ~~processes of transformation~~ processing of these materials in products. The values of this property are indispensable, for instance, to calculate or simulate the ~~transformation processes~~ processing aimed at its optimization. In the case of injection molding, this value is of special importance for the reliable prediction of the cooling time, of the product's deformations and contractions, and in general, for the optimization of the mold and even the injection molding process.

Please replace the paragraph beginning at page 4, line 13 with:

Independent of the method used, it is always necessary to obtain a temperature measurement inside the body. This can be obtained directly or indirectly. Indirect measurements measure any property that can be reliably correlated to the body's ~~temperature~~. ~~Changes~~ temperature changes in the optic birefringence of clear materials, changes in the density of the body or air that surrounds it and which generate changes in the refraction of a laser beam, for example, infrared Thermometers, etc. These methods have the advantage of being able to detect the property's change without significantly changing the temperature of the body in observation. They work well to measure temperature gradients on the bodies surface, but cannot reliably detect temperature gradients inside the body, and much less if these gradients rapidly vary during the measurement, or have spatial resolution restrictions as in the case of infrared thermometers. Direct measurements, instead, imply the presence of sensors, such as thermoelements, thermistors, resistance thermometers, etc. in contact with

the material, which in some way distort the temperature to be measured, but can be used both on the body's surface as inside it keeping provided the sensor does not cross isothermal surfaces. The error of these sensors can be quantified and its readings and thermal inertia can be compensated in such a way that they can be very reliable. This belongs to the technique's stage (See documents DE 199 34 489 A1, US 3,691,405).

Please replace the paragraph beginning at page 6, line 10 with:

Fig. 3 schematically shows the removable Unit of temperature sensors integrated to the plate when the measurement is completed.

Please replace the paragraph beginning at page 7, line 11 with:

The measurement cell is basically composed of two symmetrical bodies 1 and 2 of Fig. 1, which are in turn composed of plates 29 and 24 that hold among them two removable and exchangeable metallic ~~metal~~ blocks 20 highly heat conductive that comprise the cavity where the material to be studied is injected through the hole 3 (omitted in Fig. 2) to the chamber 22. This chamber ~~possesses~~ has a shape such that it allows the material to flow towards the cavity 21 with a flat flow front, as it can be understood by an expert of the construction technique of injection molds. The chamber 22 forms section 31 of the part in Fig. 3 and the cavity 21 the section 30 of the part called "plate" in this invention. The entrance 3 can also be located in the cell's partition line, something usual to find in injection molds. In the perforation 27 a piezoelectric sensor is installed, which serves to monitor the material's pressure during the injection. Both internal metallic blocks 20 are held between the plates that comprise the external blocks, for minimum contact and thus, minimize the heat flow outside of the internal blocks. These are isolated from the external blocks by a gap of air 23.

Please replace the paragraph beginning at page 9, line 17 with:

Fig. 1 shows the removable Unit of temperature sensors 11 and its variant 15 that appears as well in Fig. 3, which is formed by a supporting block ~~carrier~~ 18, which houses the tubes 17 for the insertion and fixation of the temperature sensors 19. These tubes are supported by the insulating removable positioning bodies 16 if variant 11 is used of Fig.1 and Fig. 2. Independent of the variants used for the positioning of the temperature sensors, these always remain uniformly distributed on one of the halves of the thickness of the plate of material to be analyzed, as shown in Fig. 7. Each sensor must be calibrated and its readings must be corrected as known by any expert in temperature measurement techniques.

Please replace the paragraph beginning at page 10, line 7 with:

The measurement Cell is installed with its entrance 3 tightly coupled to a device suitable to inject the material studied in molten form, preferably ~~a current technology~~ an injection molding machine, which generates reproducibly the pressure and temperature needed in the material to inject it in the cavity of the measurement cell according to the modern technique of injection molding widely known.

Please replace the paragraph beginning at page 10, line 12 with:

Once the stationary thermal stage is reached in the cell, the removable unit of temperature sensors 11 or 15 is inserted in the space 12 of one of the symmetrical bodies 1 or 2; the measurement cell is closed and the recording of signals is activated to initiate the injection of the material to be analyzed. The process of signal ~~taking~~ acquisition is maintained for a time sufficient so that the material's mean temperature reaches the value desired to end the process, for example, 10K above the value set for the cavity wall of the measurement cell.

Please replace the paragraph beginning at page 11, line 8 with:

Once the data ~~taking~~ acquisition process described in the paragraph above is completed, the cell is opened and the removable unit of temperature sensors is removed; which are now embedded on the plate of the material to be analyzed as shown in Fig. 3, whereby, for clarity purposes, the plastic plate has been drawn 30 as a clear body in the zone of the temperature sensors.

Please replace the paragraph beginning at page 11, line 13 with:

This device now integrated with the plate of the material to be analyzed is used to carry out an optional heating process, which allows to obtain the information needed to calculate the thermal diffusivity of the material during the heating, similar to that used in the heating, if so required. For that, the measurement cell is set to the desired temperature with the help of conventional electrical cartridges (not represented in the figures) installed in the perforations 28 of Fig. 2. ~~Or 2~~ or by flow of an attemperator liquid through the perforations 26, warmed by an attemperator not represented in the figures. Once the stationary stage is reached, the recording of signals is activated and the removable Unit of temperature sensors 11 or 15 is quickly introduced with the temperature sensors embedded on the plate of the material to be analyzed, and the measurement cell is closed.

Please replace the paragraph beginning at page 12, line 13 with:

An example of the measurements results is shown in Fig. 8, where 6 internal temperatures are recorded as well as those of the cavity during a high density polyethylene cooling experiment, for a plate 4 mm thick, cooled from 230°C to approximately 50°C, with a cavity wall temperature adjusted in stationary regime at 40°C. For the experiment, a removable Unit of temperature sensors was used as represented in 15 of Fig. 1, with 6 temperature sensors spaced 6mm among each other. The sensor closest to the wall is at 0.50 ± 0.01 mm and the sensor farthest is in the center of the cavity's height. The increment of these distances is constant and equal to 0.30 ± 0.01 mm. These curves were stored every 0.2s and converted to digital values with a resolution of 0.06°C in a data acquisition system set to the specifications given in the present invention. Once the curves were obtained, they were corrected according to the calibration values obtained for each temperature sensor of the removable unit according to the techniques known for these measurement tasks. Table 1 ~~shows~~ shows the structure required in the data to enable their analysis according to Eq. 1.

Please replace the paragraph beginning at page 13, line 8 with:

The value of the diffusivity obtained for the interval's mean temperature (158.91°C) and at a mean pressure (Cavity Pressure) of 182.3 bar is of 0.11 mm²/s. This repeats itself on every line of the data file. For the final presentation of the diffusivity curve, the values obtained are approximated, according to the usual numeric techniques, to a smooth line with a lower quadratic error. Fig. 9 shows an example of the curve for thermal diffusivity obtained from a triad of data with the central sensor in a position at 1.35 mm of the closest wall. The six temperature curves of the example enable to form 4 groups of three of adjacent temperatures to obtain other curves ~~different to the~~ of thermal diffusivity for the prevailing conditions in each of the central sensor of the corresponding groups of three.

Please replace the paragraph beginning at page 14, line 14 with:

Naturally, the realization options explained above are not the only ones possible and consequently, should not be taken as a limitation of the claims. In Fig. 6 it can be seen for example, another option to set the temperature sensors, which consists of a pair of cylinders 51 adjustable by the threaded section 50 in the positions required by the sensor. The values of the separation of the sensors among themselves and regarding the cavity wall are also values of example and should not be considered as sole possibilities. The thickness of the plate can also be achieved by methods other than changing the block-exchange blocks 20, as could be for instance the usage of plates or supplements over these blocks or any other system of general domain among the experts of injection mold construction.